



PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Muriel Y. Ishikawa et al. Docket No.: IL-10391
 Serial No. : 09/502,859 Art Unit: 2881
 Filed : February 11, 2000 Examiner: B. Souw
 For : Gamma Watermarking

DECLARATION UNDER 37 CFR §1.132

Commissioner of Patents and Trademarks
 Washington, D.C. 20231

Dear Sir:

I, Lowell L. Wood, hereby declare that I am a citizen of the United States and a resident of Simi Valley, California.

I have a Ph.D. in nuclear aspects of astrophysics from the Los Angeles campus of the University of California (UCLA), which was awarded in 1965.

I am a physicist with the University of California, Lawrence Livermore National Laboratory at Livermore, California.

I have worked in the nuclear energy field at the Lawrence Livermore National Laboratory for 37 years, working with radiochemicals both theoretically and experimentally during this interval. Aspects of my work have been recognized by award of both national and international prizes. Prior to my work at the Livermore Lab, I studied radiochemistry between 1959 and 1965 under Prof. Willard F. Libby at UCLA, a Nobel Prize-winning radiochemist, with whom I wrote my first published scientific paper (on certain geophysical aspects of radiochemistry, in 1959). Prof. Libby also was my Ph.D. dissertation adviser.

I have read the office action mailed June 19, 2002, and would like the examiner to consider my comments in general and in response to the rejections under 35 U.S.C. § 103. My comments are numbered per the Office Action.

Item 3.d. Contrary to the Examiner's stated concerns, it is sufficient for the purposes of the present invention and claims thereof to make readings of the 'instantaneous' activity of the radionuclides expressing the GW, and not the time-zeroed activity. There are no significant statistical fluctuations in the number of the atoms of radionuclides in the ink liquid (whose total number is typically in the billions), and the radionuclides used in the present invention are non-volatile, so that "evaporation of the liquid itself" is not of concern. There are no other pertinent parameters, which aren't mentioned, contrary to the Examiner's expressed concerns. The information provided is sufficient to teach how to practice the invention.

g. Contrary to the Examiner's objections, neutron activation poses no significant statistical impediments to the teaching of the invention as it stands, simply because very large numbers of neutrons are employed in any such activation and, as also stated above, billions of nuclei are typically activated in any single GW (so that statistical fluctuations in the numbers of nuclei so activated in each GW are below 0.01%).

Item 9. Claims 6, 11, 23, 28, 41, 44, 50, 55, 58 and 61 are rejected as being indefinite.

a. Regarding claims 6 and 50, indeed, the use of high energy-spectral resolution gamma-ray detectors is well-known in the art, and thus doesn't need to be specifically referenced. However, such high-performance gamma-ray detection devices are still found only in laboratory environments, and aren't yet suitable for field surveying purposes. Thus, we make the very

important distinction involving practical detectability of tags in field-surveying situations, in which it's impractical to employ laboratory-type instrumentation.

c. Regarding claim 16, note that devices are sold in the mass-market for manipulating ink-jet cartridges, primarily for (re-)filling them with ink of one's providing-and-choice, and to note that ink may be extracted from such devices by the simple expedient of opening up the ink compartment and emptying-out the ink contents therein located, followed by closing and perhaps re-sealing the ink compartment.

d. Regarding claim 23, note that the energy distribution induced upon the ion beam of given composition and energy can be pre-calculated, so that the subsequently measured distribution of radioactive ions within the object can be used to infer the energy and composition of the ion beam which created the measured distribution, which energy and composition may be employed to encode the signature information of interest.

Item 11. Rejection of Claims 1, 13, and 45 under Section 102, as being anticipated by Kane et al.

This mistaken rejection references teaching by Kane et al. which is both technically incomplete-&-erroneous, as well as irrelevant, with respect to the present invention. This incomplete and defective teaching is neither unambiguously comprehensible nor technically correct, and thus cannot anticipate the teaching of the present invention.

Kane et al. also teaches embodiments which are technically primitive and outmoded, superceded by the greatly improved detection and data-processing technologies taught and exploited in the present invention.

Furthermore, a single 'parent' claim by Kane et al. employs a multiplicity of undefined terms and thus cannot impact the present invention's claims.

The present invention also introduces several novel, useful and basic features not anticipated by Kane et al., even if a complete set of 'fixes' most advantageous to the priority of Kane et al. in the deeply flawed teaching and claims of Kane et al. were to be stipulated.

INCOMPLETE AND ERRONEOUS

The Kane et al. teaching is basically defective, in that it is thoroughly incomplete; it teaches the concept of gamma-ray tagging (which can be gained from most any radiochemistry textbook), but it fails to give even a single example of how to actually prepare and affix a gamma-ray tag for any application in a manner that complies with pertinent, long-standing U.S. government regulations regarding use-and-handling of the comparatively high unit-levels (0.5 and 1 microCurie) of radioactivity by non-licensed, untrained personnel, e.g., of the semiconductor device industry. [Moreover, the Kane et al. teaching asserts utility of tags of this general level of activity, for example in providing near-real-time detection of illicit transport of tagged items; these assertions can be demonstrated by simple calculation to be bogus. The otherwise-puzzling total lack of demonstrative calculation in the Kane et al. teaching in this basic respect thus is resolved: straightforward calculation shows that such tags can't be used for real-time suppression of illicit transport of items bearing the Kane et al. tags unless the tagged item is at most one meter distance from the largest cryogenic semiconductor detector in existence and less than 100 such tagged items are being so monitored.] The Kane et al. teaching thus doesn't meet the statutory standard of teaching a novel-&-useful capability to one of ordinary skill in the art. It therefore cannot be said to anticipate the present invention in any way.

The Kane et al. teaching is fundamentally deficient in that it treats radioactive decay as a completely deterministic process and detection thereof as

arbitrarily precise. Both of these underlying assumptions of the Kane et al. teaching are widely known to be false. Radioactive decay is understood by all cognizant physicists to be a stochastic process, and the detection and measurement of all types of radioactive decay is well-known to involve statistical fluctuations which compel the use of extended counting time-intervals and attachment of statistical error-bounds to all stated measurements.

Both of these fundamental considerations are ignored throughout the teaching Kane et al., which repeatedly and without exception regards measurement of levels of various types of radioactivity as instantaneous and precise, e.g., so as to enable real-time detection of the unauthorized movement of articles labeled with their type of tags [see, e.g., Kane Col 6, Lines 13-15; Col. 9, Lines 26-27], and so as to enable generation of an "almost infinite" number of such tags from a finite number of radioisotopes [Kane Col. 6, lines 7-9, which also uses 'radioactive isotopes' to mean two entirely different things]; in any case, there are less than 2500 radioisotopes known to contemporary radiochemistry, and virtually all of them are of such short half-life as to not be useful as practical gamma-ray tag materials.

As already noted, Kane et al. disclose only the concept of tagging; their teaching provides essentially no practical guidance with respect to how to create or to use a tag. Their disclosure of the gamma-ray tagging concept was anticipated decades earlier, as gamma-ray-emitting radionuclides were attached first to molecules (as tracers in radiochemistry and radiobiology) and then in aggregates to macroscopic objects (e.g., coins), over the interval 1940-1960, as what Kane et al. call gamma-ray tags. The relatively large quantities of activity which Kane et al. state as being of interest as single tags in their concept - 0.5 and 1 microCurie - are generally required by Federal regulation in the U.S. to be both specially sealed (so as to inhibit accidental ingestion) and specially packaged-&-labeled, so as to inhibit accidental mis-handling; they are also physically quite bulky and massive, in all of the concentrations and forms in which they are

commercially available. [For instance, Federal regulations preclude the use of microCurie activity levels in unsealed formats such as ink-type markings on the surface of an object to be handled by non-licensed personnel.] Notwithstanding all of these intrinsic and obvious challenges to the basic practicality of their scheme-set, Kane et al. provide no indication at all of how such legal and regulatory requirements are to be accommodated in any of their tagging schemes, and indeed, offer no specific preferred embodiment of any of their tags. It is the contention of the present inventors that no practical embodiment of the Kane et al. gamma-ray tag exists in any applications environment, including all those cited by Kane et al. - and thus that their teaching fails the fundamental utility test of U.S. patent law.

Kane et al. also offer no teaching as to how to create even two distinct tags comprised of any given set of radioisotopes, which is suggestive of their ignorance of how to do so in a statistically valid manner; this conceptual blunder is epitomized in the equation cited at Kane et al. Col. 8, line 5 and the preceding definitions-of-terms, which include no statistical error-bounds on any of the quantities cited and, indeed, falsely asserts an "exact mathematical relationship between isotopes A and B," which is quite thoroughly false to known physical fact, which admits only a statistically-bounded relationship between the quantities of isotopes A and B at any given time. [Note that in this characteristically muddy text passage, A and B are explicitly used to mean at least two entirely different things: they not only label two different radioisotopes in mid-passage but are earlier used to indicate the "radioactive intensity" of something, and then they are used as two undefined, implicitly time-dependent entities in the two equations at Col. 7, Lines 62 and 65; also, "radioactive intensity" isn't a conventional term in the technical literature.]

Kane et al. thus leave a student of their teaching to believe that any difference at all in any aspect of mixing together a set of radioisotopes will generate a usefully large difference between tags so created. Kane et al. offer the

analogy of a cylindrical tumbler lock, but give no idea anywhere in either their teaching or their claims of how finely any given 'tumbler' may be divided and still be useful in distinguishing between two nearly-identical 'keys' inserted to work the 'lock' containing the 'tumbler' in question, as this analogy is applied back to their teaching. The Kane et al. teaching therefore is fundamentally deficient, in that no 'recipe' is anywhere taught one of ordinary skill in the art with respect to how to generate distinctively different item-tags comprised of the same set of radioisotopes, although they assert that such distinctions exist. Kane et al.'s defective teaching erroneously leaves the student to believe that any mixture ratio at all different from some reference one is useful in generating a discernibly different tag. This teaching explicitly but falsely asserts that a "nearly infinite" number of tags are possible (once the clumsy, duplicative-definition declaration of Kane et al. Col. 6, Lines 7-9 is interpreted most plausibly).

In qualitative contrast to the conceptually defective and uselessly non-quantitative Kane et al. teaching, the present invention teaches, correctly and quantitatively, how to encode digital strings of information into mixtures of radioisotopes, complete with numerical examples in which are embedded conventional three-standard-deviation statistical bounds which in turn specify counting-rates and counting-time-intervals. The teaching of the present invention is complete and correct; that of Kane et al. is neither, and thus cannot be said to anticipate the present invention.

TECHNICALLY PRIMITIVE AND OUTMODED

Kane et al. cite primarily the use of scintillator crystals and single-channel analyzers (see Kane et al. Figures 1 and 2). These are capable only of at best 5-10% energy resolution (depending primarily on their size and shape), which spectral resolutions are entirely insufficient for the practice of the present invention, as the present invention's teaching makes obvious. [Such energy

resolutions don't permit closely-spaced gamma-ray spectral lines to be resolved, and also don't permit rejection of background radiation events of energy comparable to that of photons being measured, e.g., energy deposition in the scintillator by charged particles of cosmic ray origin.] The only other detection arrangement taught by Kane et al. is that represented in Figure 3, and makes no provision for collimation of gamma-radiation between tag and detector-element, or of shielding of the detector element; both of these features are preferred embodiments of the present invention, for the reasons taught by the present invention.

Kane et al. doesn't teach in any way about peak-shape analysis and source-detector geometry analysis for separation of spectral lines having nearly the same energy, for rejection of background, or for estimation of true source intensity. All of these more modern analytic techniques are taught and employed in the present invention, in order to derive more accurate estimates of time-averaged source intensity over the counting-interval than was conceived of by Kane et al.

The essential feature of Kane et al. is that it 'looks' in all directions for illicit motions as connoted by time-varying gamma-ray intensities, so that it doesn't need to be aimed at objects-of-interest, whose exact positions may not be well-known when it is emplaced or most recently oriented. The essence of the present invention is that it looks in only one single well-defined direction (selected by collimation), and wishes to be 'blind' in all other directions (so as to minimize background signals, provided by shielding), as it is known from whence comes the gamma-ray signals of interest: the user of the covert tags of the present invention possesses the "special knowledge" of where the tag is physically located, as well as its encoded digital contents.

In short, Kane et al. didn't have the contemporary technology base on which to stand, and their basic approach to gamma-ray tagging is necessarily far

more primitive - in concept, in technological basis and in details of teaching - than that of the present invention.

IRRELEVANT

Kane et al., throughout its teaching, is concerned with the detection of illicitly moved or transported items labeled with their tags; the Kane et al. claims deal exclusively with detection of illicit motion of tagged electronic components. In order to gain some approximation to real-time detectability and because they stipulate to no knowledge about, or control over, where the objects in question are relative to their detection apparatus in either distance or orientation, they require very large quantities of radioactivity in order to be at all technically plausible - 1 microCurie and 0.5 microCurie quantities are the only ones specifically referenced in either the teaching or claims of Kane et al. [As also noted above, such quantities are comparable to, or actually in excess of, those allowed to be handled without special licensing in most countries, specifically including the United States and, indeed, the teaching of Kane et al. repeatedly references maximum allowable exposure levels and quantities of radioactivity. The generation or use of even a few dozen such tags in a single location would exceed current Federal limits for facilities not possessing a special radiological materials-handling license, suggesting yet another practical reason why the Kane et al. invention has never seen significant use.]

In profound contrast, the present invention deals with tags having 3 orders of magnitude lower activity - nanoCuries vs. microCuries - thereby obviating human safety, aggregation and licensing concerns of such evident practical significance in the teaching of Kane et al.

At least as importantly, the present invention deals with covert tags, ones that can't be detected with field-surveying equipment and without prior knowledge of where on the tagged object the tag is actually located. The present invention's teaching specifies that its tags are used for establishing contested

ownership and authenticity, and thus involve owner/originator-privileged knowledge not only with respect to the digitally encoded contents of the tag but also its location or disposition in/on the tagged object-in-question. The present invention's teaching says that it's impossible, as a practical matter, to determine by use of field-surveying equipment of the type in Figures 1 and 2 of Kane et al. that the present invention's physically very small, exceedingly low decay-rate tags are present in-or-on an object - a qualitative distinction from the teaching of Kane et al. Similarly, the present invention's teaching declares that even use of the laboratory-type detection equipment of Kane et al.'s Figure 3 may require the use of collimation (not taught anywhere in Kane et al.) between the object-in-question and the detector - and that the location of the tag on the object-in-question must also be known in order to detect it and read out its contents in a practical manner. These are profoundly different detector-object relationships than are taught in Kane, and involves a qualitatively different type of knowledge regarding the location of the tag being detected and/or "read out."

DEFICIENT SOLE 'PARENT' CLAIM

The claims of Kane et al. consist of a single 'parent' claim and 7 other claims all specializing the parent claim in at least one respect. The parent claim of Kane et al. has multiple independent deficiencies in the current context, discussed immediately below.

First, and most obviously, the entire parent claim of Kane et al. claims "A method for identifying, authenticating and detecting unauthorized movement of one or more electronic components, comprising....". As such, Kane et al. claims impact the present invention only insofar as the present invention is concerned with detecting the unauthorized movement of at least one electronic component. The present invention makes no reference, in either teaching or claims, to detecting such unauthorized motion, and thus there is no conflict between the claims of Kane et al. and the present invention.

Second, Kane et al. teaches nothing about a "two-tier gamma spectrum," nor does it define it, so that this term in a key predicate of the parent claim [Kane et al., Col. 12, Lines 26-27] is undefined, as it also has no counterpart in the pertinent professional literature. [The "two-tier monitoring approach" of Col. 6, Line 67 self-evidently refers to a detection-interpretation strategy, not a gamma spectrum, and thus can't be construed as a definition of a particular type of gamma spectrum.]

The phrase ". . .having a majority of initially disposed radioactivity possessing a shorter total half-life than a total half-life of a remaining minority of said initialy [sic] disposed radioactivity" [Kane et al. Col. 12, Lines 27-30] has no commonly accepted meaning or interpretation, nor is it defined in the preceding text of Kane et al. - which, to be sure, makes reference to its component terms without offering any definitions thereof. Specifically, the "majority of initially disposed radioactivity" may have one, two or many different half-lives, and the term "shorter total half-life" is entirely inadequate to characterize or to limit it, thereby rendering it both meaningless and of intolerably broad claim-scope. Similarly, the "total half-life of a remaining minority of said initialy [sic] disposed radioactivity" also has no commonly accepted meaning or interpretation, nor is it defined in the preceding text of Kane et al. The "total half-life" of mixture of radioisotopes is entirely inadequate to characterize or to limit the radiological characteristics of such a mixture, so that the use of this term is both meaningless and of intolerably broad claim-scope.

Finally, the reference to "majority" and "minority" of "initially disposed radioactivity" has no generally accepted meaning, nor is it defined in the preceding text of Kane et al. "Majority" and "minority" of "initially disposed radioactivity" could, for example, plausibly refer to the respective total gamma-ray emission powers (or photon-emission rates) or to the total beta-ray emission powers (or electron emission rates) or to the total {gamma and beta} emission powers of the radioisotope(s) referenced, or it could refer to the such power (or

photon or electron emission) levels above or below some detector-specific energy thresholds for each type of emission event, or it could refer to the total masses or volumes or atom-counts of such radioisotopes, or to their time-integrated radioactive decay powers (or various fractions thereof, as already enumerated), or to many other technical measures of "radioactivity" in contemporary use. [Indeed, since beta-decay processes often involve emission of multiple gamma-rays in a single decay event, the above-cited ambiguities in the term 'radioactivity' have to be further expanded to address which gamma-ray photon energies in a single decay event of any particular kind of radioisotope are to be included in the measure of 'radioactivity' - e.g., just the photon of highest or lowest energy, or all of them, or all of them above a practical detection threshold, or...] Without a definition, this key predicate of the parent claim of Kane et al. - and the associated 'teaching' - is without useful meaning and is of intolerably broad claim-scope: it could mean anything, or nothing.

EXAMPLE NOVEL, USEFUL AND BASIC FEATURES

Relative to Kane et al., the present invention teaches, correctly and in detail, how to create tags involving quantities of radioactivity comparable to those found naturally in the human body, and then specifies how to covertly emplace these tags on-or-in an object being so tagged so as to permit their subsequent detection and high-reliability read-out only by an owner-originator whose privileged knowledge of the nature, location and content of the tag uniquely enables him/her to do so. Together, these are highly useful features, none of which are taught by Kane et al.

SUMMARY

Kane et al. was an early, error-ridden, only-vaguely-specified attempt to attain a gamma-ray-based capability to detect illicit motion/transport of electronic components. Its approach to the generation and read-out of gamma-

ray tags was rudimentary, technically unsound in its basics and insufficiently completely disclosed as to constitute a specification-in-teaching sufficient to permit one of ordinary skill in the art to practice the invention that they asserted they had made.

It is especially notable that none of the Kane et al. claims are concerned with gamma-ray tags of any general applicability, or with the actual preparation of such tags, or with the encoding of digital information into such tags, or with reading-out of digitally encoded information from such tags, or with the encoding of time information into such tags, or with the read-out of time information from such tags. It is the belief of the present inventors that Kane et al. knew that their 'teaching' on each and every one of these points was fatally deficient, and that either they elected to not make the corresponding claims, or else such teaching-unsupported claims were removed during patent examination. *The attention of the Examiner is respectfully invited to each of these omissions, and the Examiner's reflection on just why Kane et al. would fail to make any such claims is respectfully requested.*

The present invention is of far more general applicability, one who teaching is technically correct and sufficiently detailed to permit it to be actually practiced in establishing ownership, origin, etc. of a wide variety of objects by exploiting the privileged knowledge of the owner/originator with respect to the nature, location and digital content of the tag emplaced in/or the object. Notably, much of the present invention's teachings and claims have been reduced to practice and offered for commercial exploitation, and thus are known to work. In fundamental contrast, there is no evidence available to suggest that the Kane et al. teaching and claims ever saw any reduction to practice, let alone commercial use; thus, it's not surprising that its "how to use" teachings are so incomplete and unqualified, e.g., with respect to required minimum differences between radioisotopic mixture-ratios, required minimum counting-times for tags of any given disintegration-rate, intrinsic statistical limitations on read-out accuracies, etc.

Due to the many basic technical errors and ambiguities in its disclosure, its vague, incomplete and non-specific teaching and its multiply-undefined, highly-restricted sole parent claim, Kane et al. has no relevance to the present invention. Specifically, its vague, error-ridden and non-specific teachings cannot be deemed to anticipate those of the present invention. Its few, only-slightly-elaborated concepts - essentially ones lifted from any of many radiochemistry textbooks without significant intellectual value-added - are very far removed from the detailed 'recipes' needed to guide one of ordinary skill in the art in the reliable creation and read-out of the digital data-encoding covert tags, as described in the present invention.

Kane et al. don't describe how to create a unique tag - one that can be reliably distinguished from all of its fellows - as is detailed just above. They are entirely non-specific about the required degree of control of the quantities of radioisotopes to be used in creating a unique tag, and they are likewise completely silent with respect to the degrees of precision and accuracy with which each of several tags are to 'read out' so as to adequately and reliably distinguish one tag from another. They provide no useful guidance on how to either embed or to recover digital information into or from, respectively, any single tag with practically adequate accuracy and reliability. In each of these crucial respects, they therefore don't describe adequately how to actually practice their purported invention; they relate widely-understood principles but are silent about the crucial quantitative aspects of actual practice. Their multiply-defective teaching - reminiscent of the uncritical and unqualified character of a poorly-edited undergraduate textbook - thus doesn't anticipate in any respect the complete-and-correct teaching of the present invention.

Item 12. As also noted above, Kane et al. recapitulate the principle widely taught to undergraduates as to how to make a radioisotope-based

relative-time clock. There was nothing novel in this teaching, and indeed, they made no such assertion in their claims.

What is novel in the present invention were the specifics of how to encode both relative and absolute time-information in digital form into a gamma-ray tag, including the statistical bounds on the accuracy with which the embedded information could be retrieved at a later time. Kane et al. were utterly silent on the issues of absolute time-encoding (e.g., writing a creation-date in calendar time) and read-out accuracy, both of which have enormous practical significance.

Item 13. As also noted above, the Kane et al. teaching with respect to how to actually create and read-out a unique gamma-ray tag was fatally deficient, and cannot be said to anticipate in any way the present invention. In this case, Kane et al. asserted that such a tag could be created, but failed to provide correct and useful instruction on the particulars of doing so, e.g., how to distinguish it adequately from other similar tags.

Item 14. As also noted above, the Kane et al. teaching with respect to how to actually create and read-out a unique gamma-ray tag was fatally deficient, and cannot be said to anticipate in any way the present invention. The common use of 1 microCurie as a maximum level of decay-rate in a tag merely reflects the fact that this level is the highest that is generally permitted to be used in a single sealed sample without a government license.

Item 15. The use of narrow spectral lines – and of high-spectral-resolution detectors capable of exploiting the existence of such lines – is not to reduce radiation hazard in the environment, which legitimately concern Kane et al. with their relatively very high – indeed, unavoidably high – activity tags, but rather to discriminate usefully against background signals and cosmic-ray-

engendered 'noise.' The majority of the equipment embodiments of Kane et al. (e.g., that of Figures 1 and 2) is entirely lacking in high-resolution spectral capability, as also noted above. [To be sure, the liquid nitrogen-cooled semiconductor crystal detector of Kane et al.'s Figure 3 isn't known to have ever been employed for any purpose in any industrial storage or transportation environments of the general types referenced in the Kane et al teaching and claims; it's found almost exclusively in research labs, due to its high cost, physical fragility, requirement for frequent technical servicing, etc. – further calling into question the practicality of the Kane et al. teaching.]

Item 16. As also noted above, Kane et al. don't teach at all how to encode a digital bit string of any significant length in their tags; encoding a single bit in a single tag (e.g., presence or absence) is of virtually zero practical significance, certainly in the context of the present invention. The assertion that it's possible in principle to do so cannot possibly be confused with instructions sufficient for practicing by one of ordinary skill in the art – that's what a patent is all about.

The cited assertion (Kane et al. Col 7, Lines 38-40) that "Isotope abundances are determined with a precision gamma-ray spectrometer, a precise instrument utilizing...." doesn't have any quantitative aspects, and thus has more of a commercial-advocacy character than a scientific or technical one. The precision in energy of the best present-day gamma-ray spectrometers is ~0.1% for 1 MeV photons, and considerably poorer for the majority of the (lower energy) gamma-ray photons cited in Kane et al.'s Table II. However, this spectral precision is essentially entirely irrelevant to the ability to encode binary bit-strings in mixtures of radioisotopes; with 0.1% spectral resolution, there's an *a priori* 1 chance in 1000 that any two spectral lines of interest will overlap, and only approximately 1 chance in 100 that any two of the spectral lines of interest in any given tag will overlap (as there are usually less than a dozen of them).

In contrast, what is crucial in this context is the ability of the spectrometer to collect within a time-interval of practical duration an adequately large number of counts for every gamma-ray spectral line of interest from decay-events in the gamma-ray tag of interest to engender a set of statistically-reliable estimates of the relative activity-levels of the different radioisotopes used to constitute this tag. Specifically, if the set of counts obtained by the spectrometer over a practical counting interval doesn't have a sufficiently large minimum value, then at least some of the ratios of interest are uselessly inaccurate in a statistical sense, regardless of the precision of the spectrometer used to gather the counts; the remainder of the formalism cited by Kane et al. can't possibly recover from this fatal 'birth defect' in the input data. Kane et al. are entirely silent on the absolutely crucial point of collecting a usefully large number of counts from each spectral line within a practical counting-time-duration, suggesting strongly that they never considered it (and further suggesting that they never practiced their own invention); for example, they never give any hint of understanding that the number of bits which may be encoded in a tag is linear in the number of different radionuclides employed to constitute it, but only logarithmic in the product of each radionuclide activity's and the counting-time available to conduct its read-out. Their emphasis on the precision of gamma-ray spectrometers, as already noted, puzzling for its nearly-total irrelevance.

Item 17. That the tags of the present invention and those of Kane et al. may both be larger-than-microscopic isn't relevant to the validity of the present invention. As also noted above, the tags of Kane et al. were essentially imaginary or conceptual ones, as no specifications for actually realizing or using any of them was provided - in qualitative contrast to the detailed, example-rich specifications of the present invention.

Item 18. The radionuclides of interest in the present invention include those of Kane et al.'s Table II – and many more as well, including many on the proton-rich side of the “valley of beta-stability” which were not considered at all by Kane et al.

Item 19. Kane et al propose to apply their radioisotopes premixed in an ink: “...the plurality of radioisotopes is disposed in a marking medium which can be applied to the article. That is, the manufacturer of the article can integrate the plurality of radioisotopes within the identifying medium such as an ink which is affixed to the article.” In the context of the pertinent teachings and claims of the present invention, in qualitative contrast, each radioisotope is applied independently of all others, from a separate compartment in an emptied-then-refilled ink-jet cartridge. [The Examiner's attention is invited to the fact that ink-jet printers didn't exist except in commercial R&D labs when the Kane et al. application was filed, so that use of ink-jet printer technology in generating gamma-ray tags couldn't possibly have been contemplated by Kane et al.] It's also necessary to realize that it's not the automated dispensing of individual radioisotope-bearing solutions which is asserted to be novel by the present invention, but rather the quantitative dispensing of it made feasible by the digital character of picoliter droplet dispensation by modern ink-jet printer cartridges: exactly N droplets of precisely known and repeatable volume may be dispensed onto a target area only a few dozen microns in diameter within a very small time interval by computer-controlled operation of such a cartridge, where N is a integer which may be much larger than unity and may be software-determined in real-time.

Item 20. The Examiner seemingly reads much more into the teaching of Kane et al. than is actually there. What Kane et al. teach in the cited section is prefatory – and entirely insufficient – to reading out the numeric content of the

tag with useful accuracy. The counts so collected must met the criteria taught in the present invention and recapitulated above with respect to quantitative sufficiency and statistical validity - or else the revelatory ratios of counts cannot possibly be recovered with useful statistical reliability and accuracy. It's further necessary for the gamma-ray spectrometer used in collecting the count-data to be properly and precisely efficiency-calibrated relative to the tag's constituent radioisotopes, for even slightly different spectrometers of the same basic type will have different sensitivities for gamma-rays of different energies, so that ratios of count-rates for photons of different energies may differ significantly for the same tag of the same 'age' when read-out with different spectrometers of the same specified spectral energy resolution (e.g., ones whose crystal sizes or shapes or sensitive profiles may be somewhat different, or whose orientation to the tag while performing the reading-out may not be exactly the same). Such instrumental-artifact differences in the ratios-as-read-out manifestly will destroy the validity of the information extracted from the tag, even if the reading-out is done in a statistically-valid manner; spatially-precise instrumental efficiency calibration with the radioisotope mix of interest is an independent variable in the accurate read-out of gamma-ray tags - another one never mentioned in the teaching of Kane et al.

The failure of Kane et al. to relate these crucial considerations - which assuredly aren't obvious in the unusual context of gamma-ray tags - is a fatal deficiency in their teaching, which therefore can't anticipate the pertinent teaching of the present invention.

Item 21. Kane et al. nowhere teach the use of a collimator with any of their detectors - and certainly don't do so in the cited section. Indeed, the essence of the cited section of Kane et al. was the ability to detect the unauthorized motion of tags (and objects associated with them), relatively independent of the relative positions of tag and detector; this feature effectively

precludes the use of any collimation, which implies directional sensitivity. In profound contrast, the essence of the present invention is the innately covert nature of its tags, so that they can be detected and located only by the use of special knowledge belonging to the tag's emplacer, typically involving the use of the most sensitive detectors which moreover employ collimation to improve background rejection (as also described above).

Item 22. "Invisible" means incapable of being seen; to not "visibly display" or to be "inconspicuous" are quite different. "Inconspicuous" clearly is different from "invisible" - it means that something, while visible, isn't prominently so. Webster's defines "display" as "to put on or spread before the view; to make evident; to exhibit ostentatiously," so that Kane et al.'s "not...visibly display" must be seen as intended to be synonymous with their "inconspicuous," i.e., something distinct from "invisible," e.g., visible but not obvious. Clearly, if they had intended to declare the invisibility of their tags, they would have labeled them "invisible," just as the present invention did. Kane et al.'s microCurie-scale tags aren't invisible - and generally couldn't be, due to their mass, volume and likely regulatory sealing requirements; the nanoCurie-scale ones of the present invention's ink-jet-printed ones are literally invisible.

Item 23. No present claim is made that gamma-ray-emitting object-tags *per se* are novel; they weren't novel when Kane et al. was filed, either. Indeed, the initial uses of gamma-ray-emitting radioisotopes to tag objects date back to the first half of the 20th century. The dependent claims in question are restrictions of claims addressing novel tagging patterns applied to objects, one type of radiation emission of which may be gamma-rays. Kane et al. is entirely silent on the subject of tags which are spatially extended and which encode their

information, at least in part, in a spatial coordinate-dependent fashion. The citation of the Kane et al. Table II thus is entirely irrelevant in context.

Item 24. The Examiner seemingly has mis-construed the cited portions of Kane et al. What is actually referenced in the cited text are counterfeits of manufacturer's corporate logos, rendered onto their products with ordinary inks, paints, etc. for subsequent easy identification by e.g., buyers, using their unaided senses to identify the manufacturer's "visual brand-pattern." A manufacturer's logo has as an essential feature the ability to not only be seen quite readily, but to actually draw or invite visual attention, and to thereupon be readily recognized *per se*. What is referenced in the present invention is the creation of invisible analogs of the usual types of logos, ones rendered in patterns of one or more radioactive isotopes on an object, so as to be readily sensed but only by highly specialized and exquisitely sensitive instrumentation. The two types of logos are qualitatively different, along each of several distinct axes: visibility to unaided senses, mass, area, depth-of-embedding, nuclear stability, composition-mix, etc.

Item 25. The Examiner seemingly hasn't recognized that the cited claims involve various means for usefully – perhaps greatly – increasing the total information content of the tag being created, by the controlled distribution of an information-encoding mixture of radioisotopes across a two-dimensional surface. This is far from being a "mere arrangement," just as controlled distribution of ink across a sheet of paper may constitute painting or printing, and couldn't plausibly be called a "mere arrangement" of ink on the paper. The latter two controlled distributions usefully encode information on the paper, just as the mixture-of-radioisotopes 'ink' does so in creating the radioactive 'signature' of interest. [In addition to conferring invisibility to all but highly specialized instrumentation, such patterning is highly counterfeit-resistant, due to the arcane character of the 'ink' employed in generating it.]

Item 26. As just noted, the Examiner seemingly hasn't appreciated the information-added significance of spatial patterns of mixtures-of-radioisotopes 'ink' applied to a surface. A bar code is explicitly stipulated to be a two-dimensional pattern, in that the claims cited are dependent on parent claims addressing two-dimensional patterning of surfaces.

The Examiner's attention is respectfully invited to the fact that the referenced claims don't specify that the mixture-of-radioisotopes are exclusively gamma-ray-emitters - or that they emit gamma-radiation at all. If they were alpha- or beta-ray emitters, they might be viewed with interposition of most any type of fluorescent (e.g., plastic) film - or they might be directly visible, by fluorescence of the object to which they were affixed. Consonant with the present invention's overarching motif of covertness of object-marking, however, claim 40 is specifically concerned with ones, which are in all ways and via all mechanisms invisible to the unaided human senses.

Item 27. The cited text of Kane et al. refers to affixing to the article being tagged an identifying medium such as ink containing a mixture-of-radioisotopes. In marked contrast, the referenced dependent claim (claim 30) of the present application applies the radioisotopes to the surface of the object - or embeds it within it - either as a mixture embedded in a manufactured object, such as an ion-exchange or zeolite bead (claim 10), or one-radioisotope-at-a-time, via use of ink-jet-printing printing technology (claim 15); either of these is distinctively different from applying a previously prepared mixture-of-radioisotopes as a paint, with differing advantages and disadvantages. Another, qualitative distinction is that Kane et al. applies only premixed inks of gamma-ray-emitting radioisotopes, while there is no such restriction on the type of emission by the radioisotopes in the referenced claim of the present invention.

Claim 47 of the present invention involves affixing a previously-manufactured tag containing mixtures of radioisotopes to the object being tagged, while the cited Kane et al. teaching deals with applying an ink containing a mixture-of-radioisotopes directly to the object being tagged; these two tagging methods are clearly distinct, with differing profiles of convenience, utility, side-effects, etc.

Item 28. Suppression of counterfeiting has been an object of invention back to at least the time of Archimedes, but novel means for doing so continue to be validly patented. Kane et al. attempt to do so with their type of tags - which are exclusively gamma-ray-emitting, moreover in the microCurie activity range and thus readily discernible to shirt-pocket-sized radiation field-survey-type detectors - and the present invention offers to do so with ones in the nanoCurie range which can be detected and their contents read-out only with the most sensitive detectors, typically requiring collimation. The means of the present invention are greatly different, along many distinct axes, from those of Kane et al., as also discussed extensively above; it is believed that these differences are highly advantageous to the present invention, likely individually and certainly collectively.

Item 29. Again, the tagging of currency by various means, the protection of document authenticity by other various means, the protection of computer software media by yet other various means have been the subject of inventive effort for extended intervals - but valid inventive effort continues through the present time. Kane et al. certainly doesn't preempt the entire field involving the use of radioactive tags and radioactivity-tagging for any of these purposes - and, notably, Kane et al. makes no claims addressing any such applications, through they are referenced in passing in the Kane et al. teaching.

Once again, the Kane et al. tags are large in activity, in mass, in volume, and with respect to detectability-in-the-field; their quantitative differences from the tags of the present invention are so great as to become qualitative in character. The Kane et al. tags are manifestly useless for tagging currency, single-sheet documents and most computer software media, simply by reason of their various scales: in addition to being far too bulky and massive, even a modest stack of bills, documents or computer media bearing the Kane et al. tags would violate governmental regulations for total activity of aggregated ionizing-radiation sources. In acute contrast, the tags of the present invention are eminently suitable for all of these applications.

Item 30. "Computer output" subject to tagging in the context of the present invention may be many things in addition to documents. Modern computers often control machinery and object-synthesis devices whose outputs may be highly varied, with each type being subject to - and perhaps markedly benefiting from - tagging in the present context.

Item 31. The Examiner seemingly mis-construes the cited text of Kane et al. In the cited text, all objects are tagged, by implication equally so; the amount of tagging material applied to each object is stated to depend inversely on the total number of objects tagged (subsequently stipulated so as to keep personnel radiation exposures below regulatory limits).

In acute contrast, the tag in the context of the present invention is applied to only a single document in the set-of-documents referenced, and this tag is employed to detect and locate that document among many similar documents. In addition, as also noted above, the tags of the present invention is far smaller, less massive, lower activity, etc. than the Kane et al. tags, making their use-in-context far more practical in multiple respects.

Item 32. The ordering of the code blocks is not merely a matter of design choice, but is a necessary convention, one that enables the unambiguous read-out of the encoded information. If any alternate convention were to be employed, the read-out digital bit-string would have some (usually, very) different value, i.e., it would be essentially useless. Only if there is a single, universal convention for reading-out and interpreting the encoded information can its value be attained with reliability by everyone using the radioactive watermark technology; otherwise, the Tower of Babel syndrome immediately results. The one claimed is the one established as the single universal convention for this technology.

Item 35. The inapplicability of the multiply-defective teaching of Kane et al. to all claims of the present invention has been discussed extensively above, and is included by reference here.

The rejection under Monastra et al. results from a greatly over-broad interpretation of prior art by the Examiner, and cannot be sustained. The concept of embedding redundancy in a message in various forms far predates the Monastra et al. teaching, and indeed the use of redundancy schemes so advanced as to support automatic error-detection-&-correction in digital message traffic was employed in commercial electronic digital computer systems four decades ago (e.g., the IBM 7030 computer system, also known widely as "Stretch"). However, specific useful instances and novel applications of redundancy and error-correction in digital messaging environments continue to be patentable - precisely as the issuance of the Monastra et al. patent aptly demonstrates.

The present invention involves an application of redundancy and error-correction in an entirely novel type of digital message, a digital message-type never actually realized - in acute contrast to the embodiment-free concept-teaching of Kane et al. (which was entirely silent on redundant information encoding) - until the present inventive effort. As such, it's eminently entitled to

patent protection - just as Monastra et al. was, relative to the enormous wealth of prior art in redundancy-enabled fault-tolerant digital messaging that was extant when it was filed.

Furthermore, the present invention exploits the redundant encoding of digital information to control and optimize the process of reading-out the encoded information from the tag, in an entirely novel manner. There can be no doubt that this highly useful application of redundant encoding and decoding of information is patentable (e.g., in judicial proceedings, it can provide a virtually incontestable certification of the correctness of a digital tag's read-out).

a. The pervasively defective nature of the teaching of Kane et al. with respect to encoding of digital information has been discussed above, and is here incorporated by reference; this teaching of Kane et al. comprises no valid anticipation of the present invention's teachings.

That encoding redundant information - which has a non-negligible cost in bits and which adds complexity to the tag-generating process - in would be net-valuable in the gamma-ray tag context wasn't obvious to Kane et al., as they didn't include it, even in their extended teaching.

The Examiner's implicit assertion that redundant encoding somehow became obvious between the 1982 filing of Kane et al. and the 1993 filing of Monastra et al. or the present invention's filing is insupportable against the well-known and very widely employed use of redundancy in digital messaging since the later 1950s. The same consideration applies with respect to the non-obviousness of the value of redundant bit-encoding to Kane et al. and its inclusion in the teaching of the present invention: nothing has happened in the two decades since the Kane et al. filing and the present invention which would impair the non-obviousness of redundantly encoding digital information in gamma-ray tags.

The present invention doesn't propose to employ the particular encoding scheme taught by Monastra et al., so that the relevance of the

Examiner's Monastra et al. citation isn't apparent. The present invention proposes to employ a far more venerable encoding, decoding and error-correcting scheme - one that anticipates the concept of redundant encoding and error correction also taught in Monastra et al. Thus, the unquestioned validity of the Monastra et al. patent also attests to the validity of the pertinent claims of the present invention: both build valuably, inventively and non-obviously on much earlier work (e.g., that of Hamming, several decades ago), refining, adapting and specializing it in useful directions which could not have been anticipated by Hamming.

b. Kane et al. clearly didn't teach the use of redundant encoding of information - in spite of Hamming's work being extremely widely employed in myriad commercial products, both hardware and software, at the time of their filing. Thus, it clearly wasn't obvious to them, as it manifestly adds great value to gamma-emitting digital tags in some important applications (as noted above). The Examiner's unsupported contention is that it somehow has become obvious in the two decades since the filing of Kane et al., and this contention must bear the burden of rebutting the fact that it was pervasively used at the time of Kane et al., to whom it nonetheless wasn't obvious. The Examiner cites Monastra et al. as somehow pivotal in the development of redundantly encoded digital messaging, although this inventive work is unknown in the history of information technology, in profound contrast to the foundational work of, e.g., Hamming.

Monastra et al. dealt with digital bit-streams moving in space through digital communication networks, represented by transport of electrons and photons, while the present invention addresses digital bit-strings moving in time in covert tags on physical objects, represented by precision-metered ratios of gamma-ray emitting radionuclides made to be present in the manufactured tags. It's not readily feasible to think of two more different types of digital information flow or the encoding thereof - but the Examiner somehow sees the latter as

obvious in light of the former. If the Examiner's position was that both Monastra et al. and the pertinent portions of the present invention were both anticipated by, e.g., the far earlier work of Hamming, this would be a more logically defensible position - but then Monastra et al. would not be a valid patent, nor would any other of the very many patents issued since Hamming which taught one or another ways-&-means of optimal redundant encoding of digital bit-strings or -streams. Since the USPTO has found Monastra et al. to not be anticipated by the earlier foundational work, it owes the same finding to the pertinent portions of the present invention, which couldn't be less dependent on or derivative from Monastra et al. than they actually are.

Indeed, if the pertinent portions of the present invention are indeed denied patent coverage as being anticipated by Monastra et al., then logical consistency requires that all other optimal redundant bit-encoding/decoding and error-correcting schemes patented for any purpose or application since Monastra et al. also must be found to be invalidly issued.

Item 36. The innate inability of the defective and incomplete teaching of Kane et al. to anticipate the present invention is discussed above, and incorporated here by reference.

The fatal defects of the Kane et al. teaching notwithstanding, the Examiner's assertion that innovative leveraging of the use of modern technology - in the present case, technology necessarily entirely unknown to Kane et al. - to further extend the utility and applicability of a previously-extant technology is entirely unacceptable, and cannot be possibly sustained under pertinent statute and USPTO policies; such innovative leveraging of new technology relative to earlier inventions constitutes the basis of much of modern inventive effort. [This fundamental consideration is independent of the contention of the present inventors that gamma-ray tags of the types taught and claimed in the present invention are entirely novel, and that the technically defective, incomplete, embodiment-free teaching of Kane et al. in no substantive manner anticipated

them.] Thus, the presently disclosed-&claimed use of modern detector technology to accomplish the detection and reading-out of gamma-ray tags in manners intrinsically impossible for Kane et al. to teach is novel by logical necessity.

The non-obviousness of using modern gamma-ray detection technology to detect and to read-out the digital information encoded in the gamma-emitting tags of the present invention, Guilberg et al. notwithstanding, is emphasized by pertinent consequences of the very low activity, innately covert character of these tags. Specifically, it is necessary to properly position and, in most circumstances, also to properly orient even modern detector technologies relative to the tagged object in order to be able to detect the presence of a tag of the present invention, let alone to commence to read-out its encoded digital information; if such proper positioning and orientation (including, in most circumstances, collimation) isn't performed, the gamma-ray signal from the tag won't be discernible about background.

Guilberg et al. are concerned with an image reconstruction algorithm to support the detection and imaging of gamma-ray sources of far higher activity than the nanoCurie levels characteristic of the tags of the present invention, and their referenced Compton camera cannot operate successfully with the tags of the present invention (due to its low intrinsic counting efficiency, a feature of its basic geometry and, independently, its use of a scintillation crystal for a gamma-ray detector, which fatally impairs its spectral energy resolution). Guilberg et al. manifestly contemplate operation in a medical diagnosis environment, or the technical equivalent, in which gamma-radiation is available at relatively very high, readily-detected intensities, and in which gamma-ray spectral resolution is effectively irrelevant (as essentially all gamma-rays of interest will originate from the radionuclide made to be present in the region being imaged, and the image isn't a 'color,' or photon-energy-resolving, one). This is, in several independent respects, the antithesis of the basic situation underlying the present invention, in

which covertness of the tag is fundamental, it's in practice impossible to detect gamma-emissions from it except with use of the best detection technology and knowledge of the tag's nature and position within the tagged object, and high-precision knowledge of the energy of each detected gamma-ray is generally crucial.

The Examiner's assertion that "it is well-known in the art that the Compton effect can be used to determine the direction or angle of a gamma emission and simultaneously its wavelength..., thus obviating the need of high spectral resolution detectors" is technically unsupportable. All extant Compton cameras report only one of the two (Euler) angles required to determine uniquely the direction of incidence of a gamma-ray coming into the camera, and thus can determine only a ray-cone (vs. a single, unique ray-direction) of incidence; indeed, Guilford et al. specifically point out this intrinsic shortcoming of Compton cameras, and their teaching is concerned with particular ways-&-means to cope with it and to develop an image of a gamma-ray-emitting in spite of it. Moreover, any gamma-camera of any type can assay the energy of a scattering photon no more accurately than its detector can measure the energy of the Compton-scattered electron, and detectors based on scintillator crystals (e.g., those cited by Guilford et al.) are intrinsically limited to spectral energy resolutions no better than ~5%, as also noted above; this is entirely insufficient for the purposes of the present invention, as discussed also above. The Examiner's assertions thus are not correct with respect to either the incident direction or the energy of photon detection by all extant Compton cameras; this deficiency of Compton cameras is fundamental, arising as it does from the basic physics of operation of such cameras. [Note that all gamma-ray detectors based on Compton scattering must also capture all of the energy of an incident photon via a succession of Compton scattering events followed by a photoelectric absorption event, in order to "sum up" the energies of these event and produce a total energy estimate of the photon which caused the series of them.]

Specifically, contrary to the Examiner's belief, the camera which Guilberg et al. contemplated for use with their algorithm, based as it was on scintillator crystal technology and also have a poor gamma-ray coupling geometry and thus low counting efficiency, would have been entirely unsuitable, by virtue of either of these basic deficiencies, for either detecting or reading-out of the information encoded in the low-level tags of the present invention.

Neither Kane et al. or Guilberg et al. nor the two together make at all obvious the pertinent inventive material of the present invention.

Item 37. The manifold deficiencies of Kane et al., recited above, make it impossible for their teaching to anticipate that of the present invention. The Examiner's assertion that the Kane et al. reference-in-passing to radioisotopes loaded into high-specific activity ink subsequently being useable for object-marking can in some way be anticipatory of using radioactive ion-beams to apply super-low-specific activity, structured 2- and 3-D patterns onto objects is a breathtaking leap, one which simply cannot be taken seriously. [For instance, ink is intrinsically incapable of generating a 3-D pattern in an object; it at most can pattern surfaces of solid objects, not their volumes.]

The Myron teaching is concerned exclusively with uniformly ion-implanting a monocrystalline surface that exhibits channeling of high-energy ion transport, namely uniformly implant-doping a silicon wafer's surface. In profound contrast to the present invention, Myron's teaching doesn't consider the use of radioactive ions, nor does it concern itself with non-channeling surfaces, nor does it consider variable deposition-depth of the ions that it implants (i.e., in order to generate a 3-D pattern into which information may be embedded), nor is it concerned with writing information-containing patterns across the silicon wafer surface, nor into the depth of such wafers. Indeed, Myron's explicit teaching and focus-of-interest could hardly be more different from the present invention and still involve ion implantation at all.

Myron's only expressed interest is in providing an ion distribution vs. depth which is the same across the entire surface of the wafer, in spite of geometry and ion-transport variations which might occur in addressing the ion-beam to this surface. From the standpoint of the present invention, this is equivalent to writing precisely no information into the surface being addressed; Myron generates a null-information pattern, which is his interest - and the exact opposite of the interest of the present invention. The Examiner's contrary assertion notwithstanding, Myron teaches away from the present invention in the most profound manner possible - his entire inventive effort is direct to writing no information across the surfaces of interest to him.

That Myron's disclosed apparatus, even in principle, could be used to generate even a 2-D pattern of the type taught in the present invention is doubtful, since it only slightly modulated the dwell-time of the ion-beam's otherwise uniform sweeping across the surface of an object: Myron's teaching-text and the specific apparatus disclosed by him don't admit of large fractional variations in ion-beam dwell-time, and such large variations in doping versus two-dimensional position would be required in order to maintain the low levels of activity consistent with tag covertness while encoding information which could be read-out in a statistically-reliable manner.

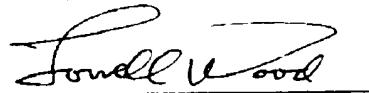
Myron's teaching speaks not at all to varying the ion distribution in depth in order to create 3-D patterns in the object being treated, his constant-ion-beam-energy apparatus is entirely incapable of doing so, and his claims are completely silent on this topic. The Examiner's unsupported assertion notwithstanding, he therefore can't be considered in any way to have anticipated or rendered obvious the exploitation of the third spatial dimension of an object for the embedding of encoded information. That information-encoding patterning in the depth dimension may be retrospectively obvious as a "logical extension" to the Examiner after reading the present invention and Myron

together is clearly irrelevant to obviousness when the present invention was made.

Myron thus is not relevant, let alone anticipatory, to the present invention because he doesn't write information into his surfaces, nor could his apparatus be used to write information into surfaces in the present 'style' involving very low levels of activity consistent with covert tags, nor does he contemplate (or have the capability of) varying ion density with depth so as to create 3-D patterns (or, indeed, information-containing patterns of any type) in the depth dimension, nor does he address in any manner the use of radioactive ion-beams (for which Myron's electrostatic deflection system may be expected to be quite unsuitable, the Examiner's unsupported contrary assertion notwithstanding, due to the high ionization levels associated with radioactive beams, levels which induce breakdown and subsequent arcing from adjacent charged metal surfaces, such as the electrostatic deflection electrodes employed exclusively by Myron). As already noted, Myron's only significant connection to the pertinent portions of the present invention is the common exercising of ion beam implantation phenomenology.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Respectfully submitted,



Lowell L. Wood

Dated: 17 December 2002